- ML is about making computers to act without explicitly programming them.

- ML algorithim can figure out how to perform task based on generalizing from data or examples and they can learn to improve themselves from the experience of past data.

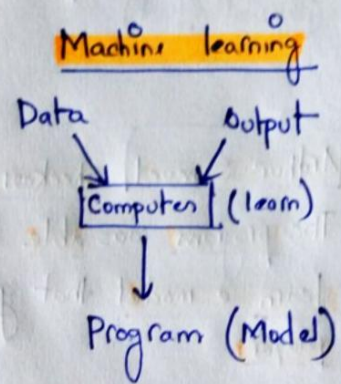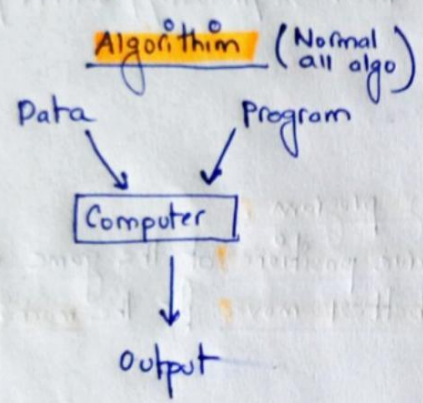- ML is all pervasive today, be it in business /industry/ science /government (physical affect)

ML History

° 1950's — [Arthur Samuel] checker playing program.

Games.

- The program was able to observe positions at the game and learn a model that gives better moves for the machine player.

- System played many games with the program and observed that the program was able to play better in the course of time with getting more experience of board games.

- Samuel coined the term machine learning and he defined learning as a field of study that gives computer ability without being explicitly programmed.

° 1960's — Neural network : Rosenblatt's perception.
  - Pattern recognition
  - Minsky & papert prove limitation of perception
  - Perceptron is the simple neural network ot ∞.
  - Perceptron is designed to illustrate some of the fundamental properties of intelligent system in general without becoming too deeply immersed in the special and frequently unknown conditions, which holds particular biological organisms.
  - But soon after (~3 years), came up with delta learning rules that is used for learning perceptron. It was used as a procedure for training perceptron. It is also known as least square problem.

1970's — symbolic concept induction
 — Natural language processing (symbolic)
1980's — Advance decision tree and rule learning.
1990's — SVM, Data mining, web application, text learning, reinforcement learning etc etc.
1994 — Self driving car road test.

To solve a problem ? How to learn

Algorithm (Normal all algo)

Data   Program

[Computer]

↓

Output

Machine learning

Data   Output

[Computer] (learn)

↓

Program (Model)

Learning → It is the ability to improve one's behaviour with experience.

Fundamental laws governs the ML —

I) ML explores algo that learn from data, builds models from data.

II) And this model used for different task like prediction, decision making or solving tasks.

Formal definition of ML — Mitchell's definition →

 — It says that a computer program is said to learn from experience E (past data) with respect to some class of task T and performance measure P, if its performance of tasks in T as measured by P, improve with experience E.

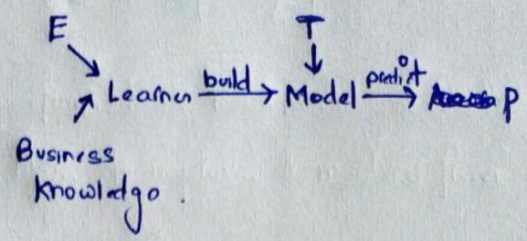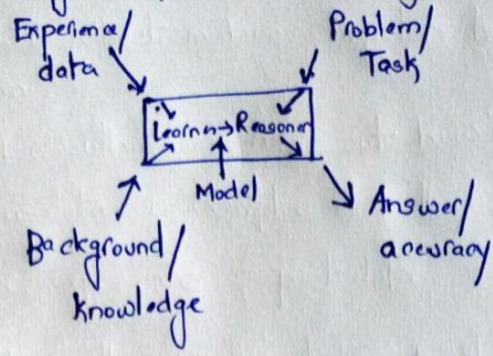 — So learning is about using experience data that is from passed problems, solving data.

 — Different type of task — Classification, regression.
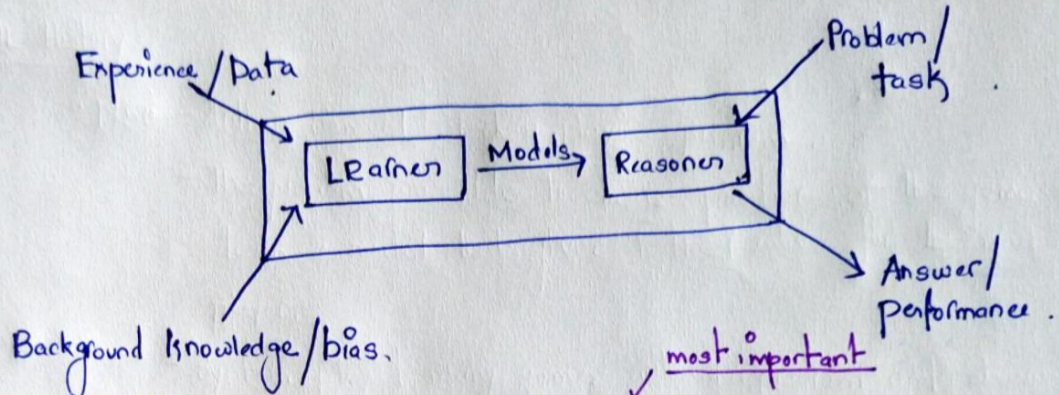
 — Experience E is also known as Data.

 — Measurement of improving P — Improve accuracy of model.

Schematic diagram of machine learning →

Experience/
data

Problem/
Task

Learning → Reasoner

Model

Background/
knowledge

Answer/
accuracy

E

Learner ──build──> Model ──predict──> P

Business
knowledge.

──── × ────

LEARNER DIAGRAM

Experience/Data

Problem/
task

Learner ──Models──> Reasoner

Answer/
Performance.

Background knowledge/bias.

most important

Steps in ML — 1) Choose the training experience (features)

2) Choose the target function (that to be learned)   class of functions

3) Choose how to represent the target function.

4) Finally choose the learning algorithm to infer target function
(Learning fn will explore the parameter on the training
experience, & so that it can come up with the best
function given its computational limitations)

NOTE — Richer the function (complex the function), more difficult to learn.

- Richer the function/richer representations means component/attributes
of the domain.

Features, class of function (also known as hypothesis)